A New Species of *Armina* (Gastropoda : Nudibranchia) from the Gulf of California

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(6 Textfigures)

Of the four suborders of nudibranchiate mollusks, the Arminacea comprises the least number of species. Although highly polymorphous, and in many respects structurally intermediate between doridiform and eolidiform animals, the three families of this suborder known to occur on the Pacific Coast of North America are readily distinguishable from each other. Both the Dironidae and Antiopellidae possess cerata, and in the former a conspicuous frontal veil is also present. In the latter the cerata extend around the anterior portion of the notum. The Arminidae are characterized by the absence of any appendages on the notum, the occurrence of gills on the under surface of the lateral notal margins, and the presence of a distinct frontal veil.

To this third family may now be added an additional species with certain morphological features so distinctive as to depart from the orthodox concept of the Arminidae. I am deeply grateful to Mr. and Mrs. Alan Wolfson, whose collections from the Gulf of California have provided me with the opportunity of examining this interesting new species.

NUDIBRANCHIA

Arminacea

EUARMINACEA

ARMINIDAE

Armina convolvula LANCE, spec. nov.

The largest of six specimens collected measured 75 mm. in length and 32 mm. in breadth (36 mm. at the widest point between the angles of the foot) when actively crawling. The smallest individual was 44 mm. long and 19 mm. broad. The specimen (holotype) upon which this description is based was of average size and measured 60 mm. long and 25 mm. broad when alive.

The body is broadest in front and tapers very slightly to a rounded tail. The entire notum is free except for a very narrow region between the rhinophores, where it slopes forward and sharply downward to expand into a broad frontal veil with an undulating anterior margin (Figure 1). The entire surface of the notum is textured with about 20 to 25 highly convoluted ridges that originate at its anterior border and run posteriorly and somewhat obliquely from the median line. In the lateral notal regions the ridges are not entire but occur as linear series of asymmetrical papillae. At the anterior end, one to three ridges continue forward between the rhinophores and run for a short

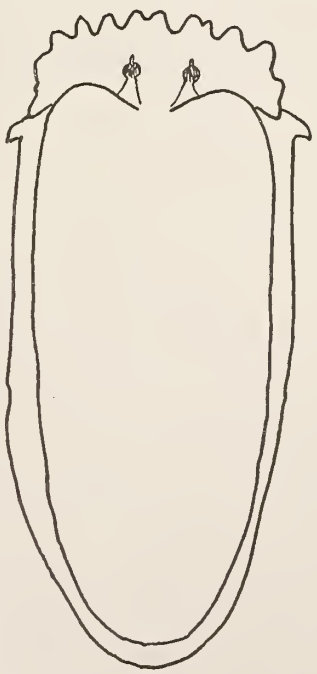

Figure 1: *Armina convolvula* LANCE, spec. nov. Dorsal view of living animal.

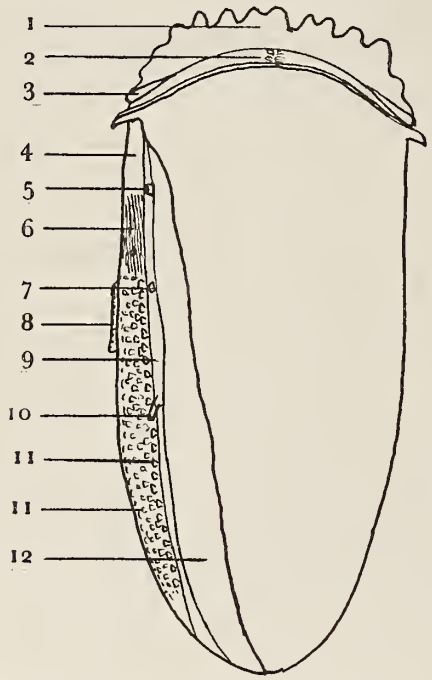

Figure 2: *Armina convolvula* LANCE, spec. nov.
Ventral view of living animal with foot rolled over to expose hyponotum.
1. dorsal fold of veil
2. mouth
3. ventral fold of veil
4. hyponotum
5. genital aperture
6. anterior branchial lamellae
7. renal pore
8. glandular lamella
9. side of body
10. anal papilla
11. posterior branchiae
12. foot

distance onto the veil. In some individuals the veil is heavily ridged, while in others only a few short ridges interspersed between irregular papillae occur. The foot is broad, very thin, and extends well beyond the lateral and slightly beyond the posterior parts of the body. It is united to the hyponotum by a vertical septum at the posterior end. Anteriorly it is weakly bilabiate, the upper lip being very thin, with lateral corners produced into acute angles (Figure 2). A ventral portion of the veil occurs as a slender, transverse flap (Figure 3), and follows the contour of the anterior margin of the foot. The mouth is situated between the flap and the upper border of the foot.

The animal is strikingly colored. The entire notum is dark chocolate brown and thickly set with small, irregular, opaque-white spots, most of which are set upon the summits of the notal ridges. Unlike most species of Armina, in which a color pattern of longitudinal stripes is displayed, this species appears to have the white markings more or less uniformly distributed over the entire notum due to the highly convoluted nature of the ridges and the uniformity of the dark background color. The foot is an intense flesh-pink with three distinct bands of color circumscribing its dorsal margin. On the outer edge a very thin white line occurs flanked by a central broad band of bright orange. Around the inner side runs a wide stripe of opalescent blue-white identical in color to that found in Hermissenda crassicornis. A thin line of the same color originates at the upper border of each rhinophore stalk, descends along its anterior border, and becomes more diffused as it proceeds obliquely to terminate at the outer posterior margin of the veil. The stalk and tips of the rhinophores are colorless, but the clavi are reddish brown. The inner surfaces of the fold of the veil are covered with minute white dots, and the hyponotum, foot, and gills are more sparsely flecked with the same. The anterior margin of the veil is orange. No variations in color pattern occurred between the largest and smallest specimens.

The longitudinally directed anterior branchial lamellae are located on the under surfaces of the lateral notal margins, about one-third of the way back, and consist of about 20 longer lamellae alternating with an equal number of shorter ones (Figure 4a). In different individuals, one, two, or three of these anterior lamellae

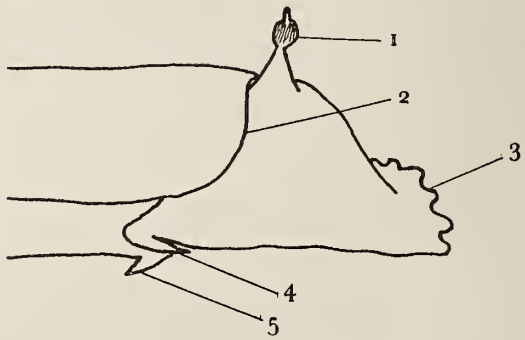

Figure 3: *Armina convolvula* LANCE, spec. nov.
Antero-lateral view of living animal.
1. rhinophore
2. anterior edge of notum
3. dorsal fold of veil
4. ventral fold of veil
5. foot angle

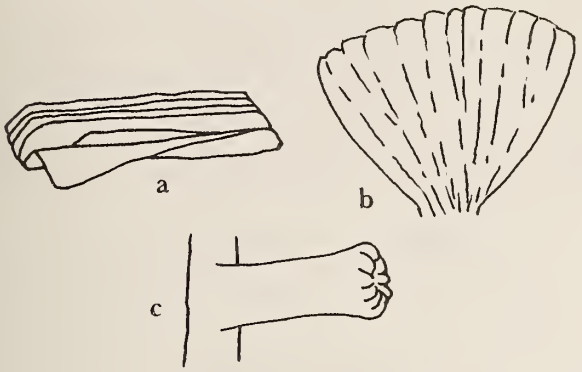

Figure 4: *Armina convolvula* LANCE, spec. nov.

a. anterior branchial lamellae with one gill folded over to expose smaller alternating gill.
b. posterior gill.
c. anal papilla.

extend back into the structurally differentiated posterior branchiae (Figure 4b). These latter gills are fan-shaped, arranged in four or five irregular rows running back nearly to the posterior septum, and attached to the subepidermal digestive diverticulae. The smallest are located nearest the notal margins, becoming increasingly larger more medianly where the major branches of the digestive diverticulae emerge. A total of 86 were counted on one side in an individual 58 mm. in length.

The rhinophores are 4.4 mm. in height and highly contractile but not retractile within a common subepidermal chamber. They may, however, be completely withdrawn below the level of the notum into temporary individual chambers formed by the stalks rolling outside-in. Such is the case in preserved specimens. At its base the stalk is wider than the clavus but rapidly tapers to a slender neck. The clavus

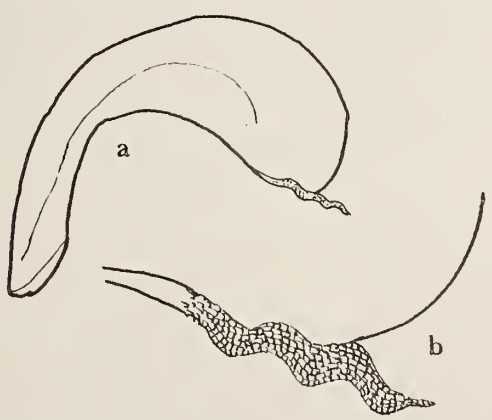

Figure 5: *Armina convolvula* LANCE, spec. nov.

a. outer view of jaw plate.
b. detail of scales of masticatory process.

is nearly vertically perfoliate with 12 to 18 leaves more or less joined along the anterior margin, and tipped with an elongated, slender papilla.

The genital aperture is on the right side of the body just anterior to and below the first branchial lamellae. Slightly over halfway back, on the same side of the body, is located an elongated anal papilla bearing a group of terminal lobes (Figure 4c). The renal pore is on a line halfway between these two apertures.

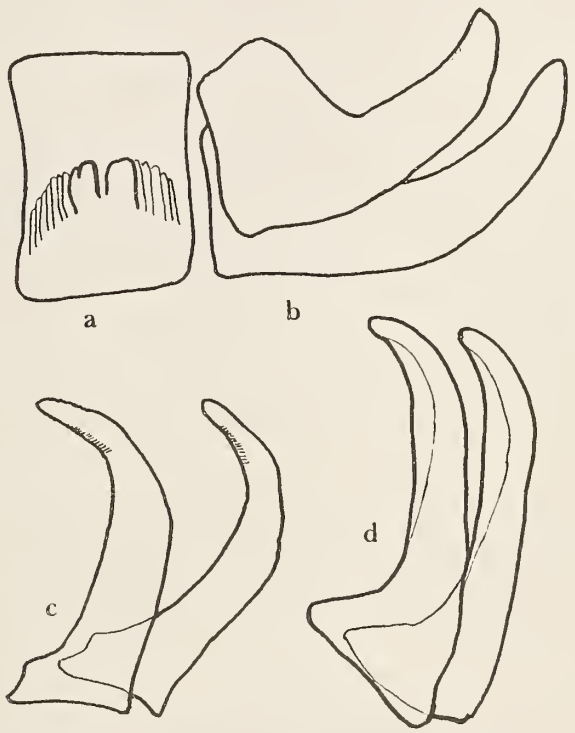

Figure 6: *Armina convolvula* LANCE, spec. nov.

Radular Teeth

a. central tooth, x 320
b. first two laterals, x 320
c. two central laterals, x 128
d. two outermost laterals, x 320

In addition to the two types of branchial lamellae, a thick, white, glandular lamella, attached close to the edge of the hyponotum, occurs about halfway back on either side.

The slender jaws are 9 mm. in length, highly arched, and a deep horn color (Figure 5a). The weak masticatory process bears a thickened, slightly undulating margin covered with several rows of scales (Figure 5b). The radula measured 5.1 mm. in length and 4.8 mm. broad and contained 40 rows of teeth in the combination 88:1:88. Central elements consisting of large, elongated, rectangular basal plates bearing cusps with five to nine denticles on ei-

ther side occurred in three specimens examined (Figure 6a). Unlike other species of Armina, the cusp does not bear a single, strong, terminal denticle, but two, relatively broad, blunt, median ones. Although the hook of the first lateral is shorter and broader, it is not differentiated from the rest (Figure 6b). The central laterals bear a highly variable number of minute denticles (usually 10 to 18) toward the tip (Figure 6c). The outermost laterals rapidly decrease in size and have smooth borders (Figure 6d). Descriptions of the jaws and radula are from paratypes in order to retain the holotype intact.

Type Locality & Range

Approximately 15 miles south of San Felipe, Mexico, on the eastern shore of Baja California. Latitude 30° 48' N., Longitude 114° 42' W. All specimens were collected in a rocky association at the lower edge of the intertidal area during a minus tide. When placed on a sandy substrate in an aquarium, a tendency to burrow was observed.

The specific name convolvula was chosen to call attention to the highly convoluted ridges on the notum.

The holotype is deposited at the California Academy of Sciences where it is registered as Paleontology Type Collection No. 12 402; it will be incorporated into the Frank Mace MacFarland Memorial Collection of Nudibranchs.

REMARKS

Three species of Armina have been described from the Pacific Coast of North America since Cooper's original description of A. californica (1862). His observations on numerous individuals from San Diego Bay, while typically lacking in detail, were adequate at that time to distinguish the species he was describing. In the ensuing hundred years Bergh (1876) proposed A. vancouverensis, O'Donoghue (1924) described A. columbiana, and Pruvot-Fol (1955) separated A. digueti, all from Cooper's species and from each other on the basis of minor morphological variations which appear to be highly inconsistent.

Marcus (1961) obtained two specimens of Armina from Tomales Bay, California, assigned one to A. columbiana and the other to A. californica, and suggested that the possession of nuchal papillae by the former was a distinguishing characteristic. The remaining species have been separated on the basis of variations in the radula and disposition of the notal ridges and related patterns of pigmentation. It is improbable that characters of such small magnitude will justify retaining all four as distinct species, but this can only be determined when series from separate geographical areas have been compared.

The propriety of including the present species in the family Arminidae, according to the concepts of Odhner (1939), is questionable because of the absence of both a common rhinophoral chamber and an entirely free notal margin. However, the figures for Armina japonica (Baba, 1949) clearly indicate an inter-rhinophoral continuity between the notum and the veil.

The present species possesses other distinguishing characteristics of the Arminidae, viz., a similar radula, two types of branchial lamellae on the underside of the notum, a renal pore situated between the anterior genital aperture and posterior anus on the right side of the body, a well developed anterior veil, and a longitudinally ridged notum free of appendages. These morphological features, in combination with a behavioral tendency to burrow in sandy substrates, indicate a close affinity to the Arminidae.

In view of the highly polymorphic nature of the Arminacea, the dearth of species so far ascribed to this suborder, and our near total lack of knowledge of the Panamic opisthobranch fauna belonging to this group, I postpone the question of creating a higher monospecific taxon and suggest the inclusion of this species for the present time in the genus Armina.

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